Second Metatarsal Cortical Thickness in Setting of Hallux Valgus Deformity: Is There Correlation?

Sara Mateen, DPM and Kwasi Y. Kwaadu, DPM, FACFAS

*Resident, Temple University Hospital Podiatric Surgical Residency Program, Philadelphia, Pennsylvania

Statement of Purpose and Literature Review

Hallux valgus deformity with first ray insufficiency has been described in the literature as “hypermobility” in which dorsal and plantar excursion exceed 5 mm in each direction. Patients with hallux valgus may experience increased plantar pressures, especially under the second metatarsal head. Clinically, patients may experience fatigue during ambulation due to compensation of the forefoot during the gait cycle, and intractable hyperkeratotic lesions of the lesser metatarsal heads.[1,2] Severe hallux valgus deformity can be appreciated radiographically with an intermetatarsal angle (IMA) greater than 15 degrees and potentially a greater hallux abductus angle (HAA) of greater than 20 degrees.[3]

In our clinical practice we tend to define hypermobility not only with clinical findings but compare with radiographic findings. To our knowledge, second metatarsal cortical thickness has not been described in the literature as “hypermobility” in which dorsal and plantar excursion of the first ray (>5mm in both planes), presence of submetatarsal pain, and presence of hyperkeratotic lesions (most commonly submetatarsal two). Radiographically, we mainly assess the IMA, HAA, and TSP. In this retrospective study, we sought to explore second metatarsal cortical thickness as it is a commonly used radiographic measure.[4]

Linear regression and scatter plot was then performed with Pearson’s coefficient to assess correlation between IMA and second metatarsal cortical thickness (Figures 1-4). There was no significant correlation when the IMA was compared to the mean 2nd metatarsal cortical thickness (Pearson correlation coefficient: -0.218; p=0.247). IMA compared to proximal 2nd met cortical thickness (Pearson correlation coefficient: 0.009; p=0.963), IMA compared to midshaft 2nd met cortical thickness (Pearson correlation coefficient: 0.45; p=0.192), and finally IMA compared to the distal 2nd met cortical thickness (Pearson correlation coefficient: -0.262; p=0.162).

Discussion

There are many factors that are considered with hallux valgus correction, including clinical findings, radiographic findings, and ultimately type of surgical technique for adequate osseous deformity correction.[5] In our specific cohort, patients underwent either a 1st MTP fusion or Lapidus bunectomy and surgical technique was performed based on patient specific symptoms and ultimately patient specific needs based on lifestyle and activity level. In our clinical practice, we assess clinical findings of “hypermobility” by amount of dorsal and plantar excursion of the first ray (>5mm in both planes), presence of submetatarsal pain, and presence of hyperkeratotic lesions (most commonly submetatarsal two). Radiographically, we mainly assess the IMA, HAA, and TSP. However, we did not find any significant correlation between IMA and second metatarsal cortical thickness, however, our results did not support this. Based on our results, there was no true associations or correlations between common clinical/radiographic indirect measures of hypermobility and the IMA. This study provides better establish future investigations.

Methodology

This was a retrospective chart review performed of 31 surgical patients that had hallux valgus deformity with subsequent elective surgical intervention (both 1st metatarsophalangeal joint fusions and Lapidus bunionectomy). Thirty patients met our inclusion criteria, one patient was excluded due to incomplete records and weight bearing radiographs were evaluated. The intermetatarsal angle (IMA), hallux abductus angle (HAA), intermetatarsal angle (IMA), hallux abductus angle (HAA), talus-seam side position (TSP), Meary’s angle, and talo-calcanear angle were documented for each pre-operative radiograph. The cortical thickness of the second metatarsal was also obtained in three regions: distal, mid-shaft, and proximal.

Results

Of the 30 included patients, 12 (40%) were male with a mean age of 45.57±13.40 (17-64) years. Nineteen (63.3%) patients had right foot surgery. Average BMI was 31.93±7.74 (21-57), Sixteen patients (53.3%) had a smoking history. Of the 30 included patients, 16 (53.3%) had IMA ≥15 degrees, 9 (30.0%) had submetatarsal pain, and 11 (36.7%) had forefoot callus. Based on the two-tailed Fisher’s exact test, there was no clinical association observed between IMA and presence of submetatarsal pain (p=0.4397) and between IMA and presence of callus (p=1.00).

Figure 1. Correlation between IMA and proximal 2nd metatarsal cortical thickness

Figure 2. Correlation between IMA and midshaft 2nd metatarsal cortical thickness

Figure 3. Correlation between IMA and distal 2nd metatarsal cortical thickness

Figure 4. Correlation between IMA and mean 2nd metatarsal cortical thickness

References


Financial Disclosures: None


